International Research Journal of Biological Sciences ISSN 2278-3202
Vol. **12(1),** 21-27, May **(2023)** *Int. Res.J. Biological Sci.*

Nutritional and antinutritional compositions of leaves of some edible medicinal plants in Rivers State, Nigeria

Ajuru M.G.* **and Wilson V.**
Dept. of Plant Science and Biotechnology, Rivers State University, Nkpolu-Oroworuokwo, P.M.B. 5080, Port Harcourt, Rivers state, Nigeria
ajurumercygospel@yahoo.com

Available online at: www.isca.in, www.isca.me
Received 1st November 2022, revised 9th April 2023, accepted 5th May 2023

Abstract

Vegetables are important part of the Nigerian diet and they meet the dietary and medicinal requirement of the Nigerian populace. This studywas conducted to investigate the phytochemical and proximate constituents of leaves extract of four edible medicinal plants in Rivers State using standard procedures. The four medicinal plants investigated include Xanthosoma mafaffa scott, Chysophyllum albidum G. Don, Annona muricata L. and Lagenaria breviflora. The phytochemical analysis gave the following values: tannin (0.08, 0.05, 0.25 and 1.00 mg/kg), phenol (0.93, 0.23, 1.24 and 3.10mg/kg), terpenoid (1.36, 3.01, 5.05 and 3.10%), alkaloid (3.25, 0.23, 0.67 and 1.80 mg/kg), flavonoid (1.87, 6.47, 4.04 and 13.00 mg/kg) and saponin (2.69, 12.63, 2.24 and 12.00%) respectively. The proximate result showed the content (%) of moisture as (83.35, 56.22, 60.57 and 51.84%), Ash (0.63, 3.66, 3.42 and 1.40%), fat (0.31, 3.82, 1.02 and 19.63%), Crude protein (2.04, 6.73, 5.22 and 3.90%), carbohydrate (11.99, 19.59, 14.03 and 13.99%) and Crude fibre (8.34, 9.97, 15.74 and 9.24%). The result showed that these plants could be used in diets to improve human health and pharmaceutical industries.

Keywords: Annona muricata, Chysophyllum albidum, Lagenaria breviflora, Phytochemistry, Proximate constituents, Xanthosoma mafaffa.

Introduction

Xanthosoma mafaffa, the only species in the aroid family indigenous to the Americans, is mostly used for culinary purposes[1], and during pre-Columbian times, it was already domesticated and cultivated[2]. According to Bown D.[1], cocoyam, distributed by traders, etc got to West Africa between the 16th and 17th centuries and is now widely known and used by the people of Africa for cultivation and food more than *Colocasia esculenta,* commonly called old cocoyam, which during the 19th century, was introduced from Southeast Asia into Asia, the Pacific and North America[1].

Xanthosoma, which is of the *Caladieae* tribe, and family Araceae includes 57 species, found mostly in the tropical and southern subtropical America, Two other genera, *Alocasia* and *Colocasia*, which are also cultivated for their edible corms and cormels, belong to this family[1,3].

Though the systematic placement of all the domesticated species of *Xanthosoma* is uncertain, and recently, the need to classify all cultivated *Xanthosoma* as *X. sagittifolium* is high[4], but taxonomists have used several vegetative features to differentiate among several additional species, including *X. violaceum* Schottsyn. *X. nigrum*, *X. atrovirens* Koch & Bouché and *X. caracu* Koch & Bouché[5].

In Cameroon, three varieties of *X. sagittifolium* are planted, which are the "white", "red or pink" and "yellow". The texture and colour of the corms, cormels and the petioles are used to distinguished among the three varieties. Due to the success of the hybridization of the "Red" and "white" cocoyams, it shows that they are different varieties of the same species. According to[1], there are two main species, *X. sagittifolium* and *X. violaceum.* Though this division relies on the vegetative features mentioned above.

The leaves of *X. violaceum* are purple in colour and the corms and cormels are purplish-grey with red eyes and purplish, reddish, pinkish, yellowish or whitish flesh, while the leaves of *X. sagittifolium* are green; the corms and cormels have whitish, yellowish or pinkish flesh and light brown skin. The cormels from *X sagittifolium* is globular in shape, while the cormels of *X violaceum* are ovate-elliptic. For many years, the cocoyam grown in Nigeria was thought to be *X. sagittifolium*, but is now identified as *X. mafaffa*[1]. There are numerous and diverse common names for cocoyam, which includes tannia, malanga, new cocoyam[5], mafafa, rascadera, calusa, mangarito, taye, macabo[6], quiscamote, mangarás and taioba[4].

Cocoyam leaves, which contain lots of minerals, vitamins, thiamine and proteins, are used as nutritious spinach in Rivers State, while the cormels, regarded as the major economic part provide easily digestible starch when eaten and are often utilized as yam and plantain substitute during scarcity in the dry season. The health benefits include boosting of the immune system, prevention of cancer, prevention of eye diseases such as myopia, cataract, etc, reduce inflammation, Protect the nervous

system, Control the blood pressure, Control the blood pressure, etc.

Chrysophyllum albidum (African Star Apple), which belongs to the family Sapotaceae, is found predominantly in Africa and is used as a traditional fruit, though, it occurs seasonally in West Africa between the months of December to April, and known as Agbaluma Udara, Udala[7]. It grows up to 25 to 37m in height, with its girth between 1.5 to 2m. The fleshy pulp is widely consumed and used to manage diabetes in traditional medicine, including the bark which is valuable in treating malaria and yellow fever, while the leaf has been used for treating stomach ache and diarrhea. In the southern part of Nigerian, the leaves, barks and roots are widely used for treating wounds, sprains and bruises; the root and seed extracts are applied for bleeding to stop and also helps prevent contamination of wounds thereby, hastening the healing process.

Nutritionally, the African Star Apple is a rich source of calcium, and each serving provides up to 10% of the recommended daily allowance (RDA). The fruit is also a good source of vitamin A and C.

It is found that *C. albidum* contain high amount of ascorbic acid when compared with orange and guava which are good source of minerals, irons and other vitamins such as sodium, magnesium. The seeds are good source of oil[8]. The roots, bark, fruit pulp and seeds of *C. albidum* have different medicinal uses, including its use as natural treatment for sprain, bruise, and wound[9].The bark is used as remedy for yellow fever, fibroids and malaria, while the leaves are employed as emollient and for treating skin eruption, stomach ache and diarrhea[10].

Annona muricata (Sour sop), belonging to **t**he family Annonaceae, is a tropical plant species and known for its numerous medicinal uses [11]. It is an evergreen plant, distributed in tropical and subtropical regions of the world. The fruits are highly used for the preparation of syrups, candies, beverages, ice creams and shakes. Different communities in Africa and South America use this plant in their folk medicine, including anticancer, anticonvulsant, anti-arthritic, antiparasitic, antimalarial, hepatoprotective and antidiabetic activities. Antinutritional studies indicated that the major constituents of *A. muricata* are annonaceous acetogenins, which have been isolated from leaves, barks, seeds, roots and fruits[12].

Lagenaria breviflora, a perennial climbing plant in forest canopy, occur from Senegal to W Cameroons, and widespread generally in tropical Africa. The leaves vary from scabrid and sandpapery, and the stem has an unpleasant smell when broken. A decoction from it is said to be used in Nigeria for headache and the root is used as a vermifuge. In Tanganyika, the root is used as a purgative. The fruits, which are dark green with creamy blotches, ovoid to 9 cm long, are commonly used in Nigeria for depilating hides. The hides are stretched and the inner surface scraped clean, and then the fruit pulp is rubbed in followed by a free application of dry wood-ash. Depilating is done after the folded hide has been steeped for a further day in the lye of wood-ash.

The extremely bitter fruit, which contains a strong amount of alkaloids, is also used in bating-bath to prepare skin to receive the tanning material. The fruit is used in Nigeria as a cathartic seed to dazed fishes. In Sudan, seeds are masticated while smoking tobacco which may lead to inducement of intoxication. The seeds contained about 30% protein, and oil, which is about 50% is mostly made up of unsaturated fatty acids and are therefore, highly nutritive. The seeds of both *C. citrullus* and *L. breviflorus* look alike, and the medicinal properties of the latter have been exploited but it's nutritive value has not been adequately documented in literatures, therefore, the seeds may be another local source of nutrients[13].

A lot of researchers have carried out proximate and phytochemical composition of the fruits of these plants while there is dearth of information concerning the nutritional and anti-nutritional composition of their leaves. Therefore, this research is carried out to determine the phytochemical and proximate compositions of the leaves of these species.

Materials and Methods

Sample Collection and Preparation: The fresh leaves of all the species were collected at Rivers State Institute of Agricultural Research and Training, Rivers State University, Nigeria and transported to the Department of Plant Science and Biotechnology where authentication was made and voucher specimens deposited in the University herbarium. The plant samples were air dried and was grounded to powder. At the end of the drying and grinding processes, each of the samples were placed into clear containers.

Quantitative Determination of Phytochemicals: Estimation of Phenol: 5g of sample was weighed into a conical flask and 200ml of acetic acid was added, shake and also allowed to stand for 4 hours. Then filter, evaporate the filtrate to about a quarter of its original volume and few drops of concentration NH_4OH solution was added to the precipitate the alkaloid, then filter the precipitate formed through a weighed filter paper, place the filter paper in the oven and allowed to dry at 60^0C till constant, then weigh the filter paper again and record weight as (w_2).

Estimation of Tannin: 1g of well dried blended sample was weighed into a conical flask and 10ml of distilled water was added and agitated, then left to stand for 3omins at room temperature, centrifuge at 2500rpm for 15mins, 1ml of supernatant was measured into a 10ml volumetric flask and 1ml of folin ceocalteu reagent and 1ml of saturated Na_2CO_3 solution were added, the solution was diluted into 10ml of distilled water then incubate for 30mins at room temperature.

Estimation of Saponin: 20g of will blended sample was weighed into a conical flask and 100ml of 20% aqueous ethanol

was added, then heat content in a hot water bath for 4 hours with continuous stirring at 50^0C and filter. Then re extract using 200ml of 20% ethanol and combine both extract, then reduce of volume of extract to 40ml by evaporating in a water bath at 90°c and transfer the concentration into a 250ml separating funnel and add 20ml of diethyl-ether (petroleum ether) and shake vigorously then discard the clear ether layer and keep the aqueous layer and add 60ml of n-butanol to the aqueous layer in the separating funnel and wash the combined butanol layer twice with 10ml of 5% aqueous NaCl then add the remaining solution in a weigh petri dish (w_1) and dry the petri dish in an oven at about 90^0C, reweigh the petri dish and record as (w_2).

Estimation of Terpenoids: 0.4g of sample was weighed into a conical flask, 9ml of ethanol was added and soaked for 24hours. Then it was filter using a separating funnel and petroleum ether, 10ml of distill water was added. The sample was collected with a pre weighed moisture can and then dried in oven for complete dryness for 1hour at 150^0C.

Estimation of Alkaloid: 5g of sample was weighed into a conical flask and 200ml of 10% acetic acid in ethanol was added, then shake and allow standing for 4hours. Filter and evaporate the filtrate for about a quarter of its original volume, few drops of concentration NH_4OH solution was added to precipitate the alkaloid. Then filter the precipitate form through a weighed filter paper, place the filter paper in oven and allow drying at 60^0C till constant.

Estimation of Flavonoids: 10g of sample was extracted repeatedly with 100ml of 80% aqueous methanol at room temperature, the solution was filtered through whatman filter paper (125mm). The filtrate was later transferred into a crucible and evaporated into dryness over a water bath and weighed to a constant weight.

Proximate Composition Method: Determination of Crude Protein: This was done by Kjelcahl method. Firstly, 0.1 gram of the samples were weighed respectively into a clean conical flask of 250ml capacity, 3 grams of digestion catalyst were added into each of the flask, and 20mb of concentrated sulphuric Acid was also added and the samples were heated to digest. The content changed from black to sky blue coloration, the digestions were cooled to room temperature and was diluted to 100ml with distilled water.

Secondly, 20mls diluted digestion was measured into a distillation flask, and the flask was held in place on the electro thermal heater or hot plate. The Distillation flask was attached to a Liebig condenser connected to a receiver containing 10mls of 2% Boric acid indicator. 40mls Sodium Hydroxide was injected into the digest via a syringe attached to the mono-arm steel head until the digest became strongly alkaline. The mixture was heated to boiling and the distilled ammonia gas via the condenser into the receiver beaker. The color of the Boric Acid changed from purple to greenish as Ammonia distillate was introduced into the Boric acid.

The distillate was titrated with standard 0.1m hydrochloric acid solution back to purple from greenish. The volume o 'hydrochloric acid added to effect this change was recorded as tired value.

The formula is given as;

$$\% \text{ Protein} = \frac{\text{Titre value X 1.4 X 100 X 100 X 6.25}}{\text{1000 x 20 x 0.1}}$$

Where titre value is the volume of HCl used in titrating the Ammonium distillate. 1.4 is the Nitrogen Equivalent to the normality of HCl used in the titration 0.1N, 100 is the total value of digest dilution 100 - percentage factor, 1000 is the conversion factor from gram to milligram, 20 is the integral volume of digit analysed or distilled. 0.1 is the the weight of samples in gram digested.

Determination of Carbohydrate: This was determined using the method of Cleg Anthrone. Firstly, 0.1 gram of the samples were weighed into a 25mls volumetric flask. Then 1 ml distilled water and 1.3mls of 62% perchloric acid were added and she ok for a period of 20mins to homogenize completely. The flask was made lip to 25mls marked with distilled water and stopper. The solution formed was filtered through a glass filter paper or allowed to sediment and decanted. 1ml of the filtrate was collected and transferred into a 10ml test tube, this was diluted to volume with distilled water. 1ml of working solution was pipette into a clean test tube and 5mls anthrone reagent was added. 1ml distilled water and 5mls anthrone reagent was mixed. Similarly, and the whole mixture were read, at 630 nm wavelength using the 1ml distilled water and the 5mls anthrone reagent prepared as blank.

Solution glucose of 0.1 ml was also prepared and was treated as the sample with anthrone reagent. Absorbance of tie standard glucose was read and the value of carbohydrates as glucose was calculated using the formula below;

$$\% \text{ CHO as Glucose} = \frac{\text{25 X Absorbance of sample}}{\text{Absorbance of standard glucose X 1}}$$

Determination of Moisture: This was determined using Air Oven Method. A gram of the sample was weighed and put in a clean dried porcelain evaporating dish. This was place in an oven to maintain a temperature of 105°C for six hours. The evaporating dish was cooled in desiccators to room temperature, then it was reweighed and recorded. Thus the formula is given below

$$\% \text{ Moisture} = \frac{\text{Weight of fresh sample} - \text{Weight of dried sample}}{\text{Weight of sample used}} \text{X} \frac{100}{1}$$

Determination of Crude Lipid: This was done using Soxhlet Extraction Method. Firstly, 2 gram of samples were inserted into a filter paper and were placed into a soxhlet extractor. The extractor was placed into a preweighed dried Distillation flask.

Then the solvent (acetone) was introduced into the distillation flask via the condenser end attached to the soxhlet extractor. The set up was held in place with a restorted stand clamp, cooled water jet was allowed to flow into the condenser and the heated solvent was refluxed as a result. The lipid in the solvent chamber was extracted in the process of continuous refluxing. When the lipid was observably extracted completely from the sample under test, the condenser and the extractor was disconnected and the solvent was evaporated to concentrate the lipid. The flask was then dried in the air oven to constant weight and re weighted to obtain the weight lipid. The formula is given below;

$$\% \text{ Lipid} = \frac{\text{Weight of flask and extract} - \text{Weight of empty flask}}{\text{Weight of sample extracted.}} \text{X} \frac{100}{1}$$

Determination of Total Ash Content: This was determined using furnace method. The sample was weighed into porcelain crucibles, which was previously preheated and weighed. The crucibles were inserted into a muffle furnace and regulated to a temperature of 630°C for three hours and allowed to cool to room temperature and reweighed. Formula for calculating percentage ash is given below;

$$\% \text{ Ash} = \frac{Weight\ of\ crucibles + Ash\ sample - Weight\ of\ empty\ crucible}{Weight\ of\ sample} \text{X} \frac{100}{1}$$

Determination of Crude Fibre Content: Weigh out 2 to 3 g of defatted, dry sample. Place in the flask and add 200 ml boiling sulphuric acid solution concentration (1,25%), the acid concentration 5% should be taken from (50 ml) of acid and (150ml) of distilled water until the concentration reduces. Attach the condenser and bring to boiling point ii one minute if necessary, add antifoam. Boil for exactly 30 minutes, maintaining the volume of solution constant by add heat distilled water and swirling the flask periodically to remove pa: tides adhering to the sides. Lining the Buchner funnel with the filter paper and boiling water. At the same time, at the end of the boiling period, remove the flask, allow to rest one minute and filter the contents carefully, using suction or vacuum. Filtration should be carried out in less than 10 minutes. Wash the filter paper with boiling water. Transfer the residue to the flask using a retort containing 200 ml of boiling NaOH solution and boil for 30 minutes, the usefulness o 'the base solution is to analyze the parts of nitrogen in proteins and making Saponification with the fat.

Preheat the filtration crucide with boiling water and carefully filter the hydrolyzed mixture after letting it rest for 1 min, wash the residue with boiling water, with the HCl solution and then again with boiling water, finishing with three washes with petroleum ether. Place the crucible in an oven set at 105°C for 12 hours then cool in dryer. Quickly weigh the crucible with the residue inside (do not handle then) and place in the crucible furnace at 550°C for 3 hours. Leave to cool in a dryer and weigh them again. Formula for calculation is given below;

Crude fibre content (%).

$$\frac{\text{Weight of Crucible with Fry Residue (el} - \text{Weight of Crucible with Ash (g)}}{\text{Weight of Sample (g)}} \text{X } 100$$

Data Analysis: Data obtained from the phytochemical analysis were subjected to Analysis of Variance, this was done using SPSS.

Results and discussion

Phytochemical Constituents: Phytochemical content indicated the presence of Tannin (0.081±0.00, 0.05±0.01, 0.25±0.01 and 1.00±0.14mg/kg) Total Phenol (0.933±0.03, 0.23±0.00, 1.24± 0.03 and 3.10±0.42mg/kg), Terpenoid (1.296±0.04, 3.01±0.00, 5.05±0.91 and 3.10±0.07%) Alkaloid (3.252±0.01, 0.23±0.10, 0.67±0.05 and 1.80±0.28mg/kg) Flavonoid (1.868±0.05, 6.47± 0.001, 4.04±0.36 and 13.00±0.85mg/kg), and Saponin (2.688± 0.25, 12.63±0.23, 2.24±0.11 and 12.00±0.00%) respectively, as shown in Table-1.

Proximate Composition of the Leaves of the Species Studied: Proximate composition showed the presence of moisture (83.35±0.65, 56.22±0.05, 60.57± 0.24 and 51.84± 0.28%), Ash (0.62±0.018, 3.66±0.12, 3.42±0.12 and 1.40± 1.13%), Fat (0.31±0.01, 3.82±0.04, 1.02± 0.29 and 19.63± 0.21%), Crude Protein (2.035±0.06, 6.73±0.15, 5.22± 0.00 and 3.90± 0.57%), Crude Fibre (1.69±0.049, 9.97±0.02, 15.74± 0.97 and 9.24± 0.64%) and Carbohydrate (11.99±0.516, 19.59±0.00,14.03± 0.50 and 13.99±0.57%)respectively, as shown in Table-2.

Table-1: Phytochemical Compositions of leaves of the Species Studied.

Leaf Sample	Tannin (mg/kg)	Total Phenol (mg/kg)	Terpenoid (%)	Alkaloid (%)	Flavonoid (%)	Saponin (%)
Xanthosoma mafaffa	0.081±0.00	0.933±0.03	1.296±0.04	3.252±0.10	1.868±0.05	2.688±0.25
Chysophyllum albidum	0.05±0.01	0.23 ±0.00	3.01 ±0.00	0.23±0.h03	6.47±0.001	12.63±0.23
Annona muricata	0.25± 0.01	1.24±0.03	5.05 ± 0.91	0.67± 0.05	4.04± 0.36	2.24± 0.11
Lagenaria breviflora	1.00 ± 0.14	3.10 ± 0.42	3.10±0.07	1.80± 0.28	13.00 ± 0.85	12.00 ± 0.00

Table-2: Proximate Composition of the Leaves of the Species Studied.

Leaf Sample	Moisture Content (%)	Ash (%)	Fat (%)	Crude Protein (%)	Crude Fibre (%)	Carbohydrate (%)
Xanthosoma mafaffa	83.35±0.65	0.62±0.02	0.31±0.01	2.04±0.06	1.69±0.049	11.99±0.52
Chysophyllum albidum	56.22±0.05	3.66±0.12	3.82±0.04	6.73±0.15	9.97±0.02	19.59±0.00
Annona muricata	60.57± 0.24	3.42 ±0.12	1.02± 0.29	5.22± 0.00	15.74± 0.97	14.03 ± 0.50
Lagenaria breviflora	51. 84± 0.28	1.40 ± 1.13	19.63 ± 0.21	3.90± 0.57	9.24 ± 0.64	13.99 ± 0.57

Discussion: Phytochemicals are considered to be beneficial to human health because they are seen to be non-nutritive plant chemicals that have protective properties from ailments. The result of phytochemical composition presented in Table-1 showed that the leaves of all the plant species studied contain the following phytochemicals: tannin, saponin, phenol, alkaloid, flavonoid and terpenoid.

Phenolas an antiseptic and disinfectant, is active against a wide range of microorganisms including some fungi and virus. It is also used as an oral analgestic or anesthetic in products, also used as a skin disinfectant to relieve itching[14]. Polypenol also act protectively and help prevent the progression of certain skin disorders both embarrassing minor problems (e.g. acne, Wrinkles) or serious potentially life – threatening diseases such as cancer[15].

Tannins possess astringent properties, as they promote rapid healing and the formation of new tissues on wounds and inflamed muscosa. They are also used in the treatment of varicose ulcers, haemorrhoids, minor burns, frostbite, as well as inflammation of gums[16].

Saponins promote Cardiovascular health due to the ability to lower cholesterol level, decrease blood lipids, lower cancer risks, it also helps in promoting the immune system which leads to general protection of the human body. They also have chemotherapeutic properties as they have mechanisms that control protein expression linked to cell cycle, cancer progression and metastasis[17].

Terpenoid have substantial pharmacological bioactivity, it contains curcumin which holds anti-inflammatory, antioxidant, anticancer, antiseptic, antiplasmodial, astringent, digestive properties.

Alkaloid Play an essential role in both human medicine and in an organism's natural defense. In plants alkaloids protect plants from predators and regulate their growth, which in human it is been used a cardio-protective and anti-inflammatory agent. Alkaloids have a wide range of pharmacological properties as quinine (for anti-malarial), ephetrine (for antiasthma) vincamine (for vasodilatoral). Although alkaloids act on a diversity of metabolic systems in humans and other animals, they almost uniformly evoke a bitter taste[18]. Prior to the development of a wide range of relatively low-toxic synthetic pesticides, some alkaloids, such as salts of nicotine and anabasine, were used as insecticides. Their use was limited by their high toxicity to humans[19].

Flavonoidsare indicated to have anti-oxidative activity, free radical scavenging capacity, coronary heart disease prevention, hepatoprotective, anti-inflammatory and anticancer activities. In addition, some flavonoids have inhibitory activity against organisms that cause plant diseases, e.g. Fusarium oxysporum[20].

The result of proximate composition presented in Table-2 showed that the leaves of all the plant species studied contain the following nutritional properties: moisture, ash, fat, crude fibre, crude protein and carbohydrate.

Moisture or water dissolves other substances because it is a universal liquid, as well as transport nutrients and other materials throughout the body, enabling every organ to carry out its function effectively[21]. The moisture content of any food is an index of its water activity[22], and is used as a measure of stability and susceptibility to microbial contamination[23]. The moisture content is within the range of required value as safe storage limit for plant food materials[24]. This indicates that the roots can be stored for a long time without the development of mould.

The ash content is a measure of the total mineral content of a food[25]. Mineral is required by the body for proper physiological functioning. Ash content of a plant based food is the function of the mineral elements present. Dietary ash has proved helpful in establishing and maintaining acid-alkaline balance of the blood system, as well as in controlling hyperglycaemia condition[26]. The values compared favourably with the values reported in some Nigerian leafy vegetables.

Fats and oils are good sources of energy and components of biological membranes and very important in human health[27]. Fats as secondary plant products, yield more energy per gram than carbohydrates, and also contain a lot of fat-soluble vitamins and essential fatty acids such as those present in the fats of natural foods. Fats and oils help to regulate blood pressure and play useful role in the synthesis and repair of vital cell parts[28].

The high content of these nutrients in the roots of these species makes them a good source of energy and crude fat.

Information from epidemiological studies suggest that increased fibre consumption may reduce the incidence of certain ailments such as colon cancer, coronary heart diseases, diabetes, high blood pressure, obesity, and various digestive disorders. Fibres are parts of fruits, grains and vegetables which can neither be digested nor absorbed by the human system[29,30]. As an important part of any diet, fibre aids indigestion. An average adult is recommended to consume 18 to 32 grams of fibre daily. Generally, the function of dietary fibre in the human body is to reduce the rate of glucose absorption into the bloodstream, thereby reducing the risk of hyperglycaemia, and also to reduce the levels of plasma cholesterol and prevent colon cancer and cardiovascular diseases. Fibre soften stool and therefore, prevents constipation[31].

According to Pearson[30], A. plant foods with more than 12% of its caloric value from protein are considered good source of protein. Therefore, both species are not good sources of protein, but they could still be used as supplements in protein deficient food. This is comparable to the daily protein requirement of 23-56g. Proteins in the body function in the production of hormones, enzymes and blood plasma, in addition to being immune boosters and also helping in cell division as well as growth[32]. Protein is an essential component of human diet which is needed for the replacement of dead tissues, supply of energy and adequate amount of required amino acids[33].

Carbohydrate is the major component of all normal diets, providing most of the energy required. Carbohydrates are by-products of photosynthetic processes. Carbohydrates are the major source of energy and are consumed by man and animals. They are hydrolyzed in the body to yield glucose which can be utilized immediately, or stored as glycogen in the muscles and liver for future use[34].

Conclusion

Throughout the years, plants have contributed so well towards the wellbeing of humans and even animals, in the areas of food and medicine. The four plants studied in this research all contain the important components required to fight various diseases of humans. The nutritional constituents in all the plants is high which indicated that the plants are good sources of dietary supplements required by the human body. All these can be harnessed for culinary and medicinal purposes. Pharmaceutical Industries should exploit the phytochemicals components for the formulation of drugs.

References

1. Bown, D. (2000). Aroids: plants of the Arum family. Timber Press, pp. 46.

2. Montaldo, A. (1991). Cultivo de raíces y tubérculos tropicales. IICA, 2da Edición. San José, Costa Rica, pp. 407.

3. Mayo, S.J; Bogner, J. and Boyce, P.C. (1997). The genera of Araceae. London, Royal Botanic Garden, Kew, pp. 54.

4. Bermejo, J. E. H., & León, J. (Eds.). (1994). Neglected crops: 1492 from a different perspective. Vol. 26. Food & Agriculture Org..

5. Goldsworthy, P. R., & Fisher, N. M. (1984). The physiology of tropical field crops (No. BOOK). John Wiley & Sons.

6. López, M.; Vásquez, E.; López, F. (1995). *Raíces y tubérculos*. Pueblo y Educación, Universidad Central de Las Villas, Cuba, pp. 312.

7. Adebayo, A.H.; Abolaji, A.O.; Opata, T.K. and Adegbenro I.K. (2010). Effects of ethanolic leaf extract of *Commiphora africana* (Burseraceae) on lipid profile in rats. *Int. J. Pharmacol*., 5, 213-223

8. Amusa N.A., Ashaye O.A. and Oladapo M.O. (2003). Biodeterioration of the African star apple (Chrysophyllum albidum) in storage and the effect on its food value. *Afr. J. Biotechnol*., 4, 43-60

9. Ashour, M.; Wink, M.; Gershenzon, J. (2010). Biochemistry of Terpenoids: Monoterpenes, Sesquiterpenes and Diterpenes. *Biochemistry of Plant Secondary Metabolism*, 258–303

10. Okwu, D.E. and Omodamiro, O.D. (2005). Effects of hexane extract and phytochemical content of *Xylopia aethiopica* and *Ocimum gratissimum* on the uterus of Guinea pig. *Bio-Research*., 3, 40–44.

11. Okoli, F.W. and El-Shemy, H.A. (2017). *Annona muricata*: Is the natural therapy to most disease conditions including cancer growing in our backyard? A systematic review of its research history and future prospects. *Asian Pac J. trop. Med.,* 10(9), 835-848.

12. Moghadamtousi, S.Z.; Fadaeinasab, M.; Nikzad, S.; Mohan, G.; Ali, H.M. and Kadir, H.A. (2015). *Annona muricata* (Annonaceae): A Review of Its Traditional Uses, Isolated Acetogenins and Biological Activities. *Int. J. Mol Sci.,*10, 16(7), 15625-58. doi: 10.3390/ijms160715625

13. Figueiredo, E. and Smith, G.F. (2008). Plants of Angola Strelitzia. National Botanical Institute, Pretoria. 22, 1-279.

14. Chen, H. Q., Zuo, W. J., Wang, H., Shen, H. Y., Luo, Y., Dai, H. F., & Mei, W. L. (2012). Two new antimicrobial flavanes from dragon's blood of Dracaena cambodiana. *Journal of Asian natural products research*, 14(5), 436-440.

15. Brohem, C. A., da Silva Cardeal, L. B., Tiago, M., Soengas, M. S., de Moraes Barros, S. B., & Maria-Engler, S. S. (2011). Artificial skin in perspective: concepts and applications. *Pigment cell & melanoma research*, 24(1), 35-50.

16. Elekofehinti, O. O.; Kamdem, J. P.; Meinerz, D.F.; Kade, I.J.; Adanlawo, I. G. and Rocha, J. T. (2017). Saponin from the fruit. *Pathophysiology*., 21, 55-74.

17. Elekofehinti, O. O. (2015). Saponins: Anti-diabetic principles from medicinal plants - A review. *Pathophysiology*., 22, 95-103.

18. Cushnie, T. P.; Cushnie, B. and Lamb, A. J. (2014). Alkaloids: An overview of their bacterial, antibiotic-enhancing and antivirulence activities. *Int. J. antimicro Agent*., 44(5), 377-386.

19. György M.; Miklós N.; Viktor A. (2002). Pesticide chemistry. Elsevier, pp. 21–22

20. Galeotti F.; Barile E.; Curir P.; Dolci M. and Lanzotti, V (2007). Flavonoids from carnation (Dianthus caryophyllus) and their antifungal activity. *Phytochemistry Letters.,* 1, 44–48. doi:10.1016/j.phytol. 2007.10.001

21. McDonald S., Prenzler P.D., Antolovich M. and Robards K. (2001). Phenolic content and antioxidant activity of olive extract. *Food Chemistry*., 73, 73-84.

22. Olutiola, P. O; Famurewa, O. and Sonntag, H.G. (1991). An Introduction to General Microbiology, a Practical Approach. Germany: Heidelberger Verlagasanstalt and Druckerei GmbH Heidelberg, p.45

23. Uraih, N., & Izuagbe, Y. (1990). Public health, food, and industrial microbiology. Uniben press.

24. Umar, K. J., Hassan, L. G., & Ado, Y. (2007). Mineral composition of Detarium microcarpum grown in Kwatarkwashi, Zamfara state, Nigeria. *Int. J. Pure Appl. Sci*, 1(2), 43-48.

25. Vunchi, M. A; Umar, M.A; King, A.A; Liman, G.J and Aigbe, C.O. (2011). Proximate, Vitamins and Mineral composition of Vitexdoniana (black plum) fruit pulp. *Nigerian Journal of Basic and Applied Science*, 19(1), 97-101.

26. Gokani, A.; Ibrahim G. and Shah, H. (1992). Alkaline-ash foods in the dietary management of diabetes mellitus. *International Journal of Diabetes in Dev. Countries*., 34, 78-87

27. Michelle, A; Hopkins, P.J.J; McLaughlin, C.W; Johnson, S.E; Warner, M.Q; Lahart, D.F and Wright, J.D. Lipids. (1993). Human Biology, and Health. Eagle Wood Cliffs, New Jersey, Usa-Prentice Hall, 1176-1180.

28. Dutta, A.C. (2003). Botany for Degree Students. 6th Edition. Oxford University Press, New Delhi, India, pp. 32-39

29. Agarwal, S.K. and Rastogi, R.P. (1974). Triterpeernoid Saponins and their genius. *Phytochemistry*., 11, 54-64

30. Pearson, A. (1976). Vitamins in fruits: The Biochemistry of fruit and other products. Academic press; New York, 369-384.

31. Ayoola, P.B. and Adeyeye, A. (2009). Proximate Analysis and Nutrient Evaluation of Some Nigerian Pawpaw Seed Varieties. *Sci. Focus*., 14(4), 554-558.

32. Okeke, C.U. and Elekwa, I. (2006). Proximate and Preliminary Phytochemical analysis of avocado pear persea gratissima Gaertion f. (family lauraceae). *Nigerian Journal of Botany*., 4: 23-31.

33. Igite, G.O.; Iwara, I.A.; Mgbeye, B.I.; Uboh, F.E. and Ebong, P.E. (2013). Phytochemical, Proximate andNutrient Composition of *Vernonia calvaona* Hook (Asteraceae): A Green-leafy Vegetablein Nigeria. *J. Food Res*., 2(6), 111-122

34. Okeke, C. U., Izundu, A. I., & Uzoechinda, E. (2008). Phytochemical and proximate study of female pawpaw (Carica papaya Linn.) Caricaceae. *Journal of science, Engineering and Technology*, 15(2), 8207-8216.